第２章　海洋資源探査船計画

第２章　海洋資源探査船計画

２－１　探査の目的

広大なフィリピンの領海内には未開発の鉱物資源が眠っていると考えられるが，その中でも特に大陸棚および浅海地域の鉱物資源を開発するために地震探査，磁力探査および海底採泥を探査船で行い，石油および有用鉱物の存在場所範囲を明確にしようとしている。

２－２　探 査 内 容

探査によって得られたデーターおよびサンプルの解析は添付フローチャートに従って大きく３つの流れで，チャートに記載してある各専門部所によって分析および解析が行われる。最終的にはMMRDで取りまとめて報告書および地図（１０万分の１あるいは２５万分の１）の形で公表される。

３つの流れでは下記の分析が行われる。

- 地震探査のデーターからの地層断面図作成
- 磁力探査のデーターからの残留地磁気図作成
- 海底岩石およびたい積物の分析（年代の推定および有用鉱物の判定）

本プロジェクトの船上作業および陸上作業の範囲は，フローチャートの中に区分して示す。

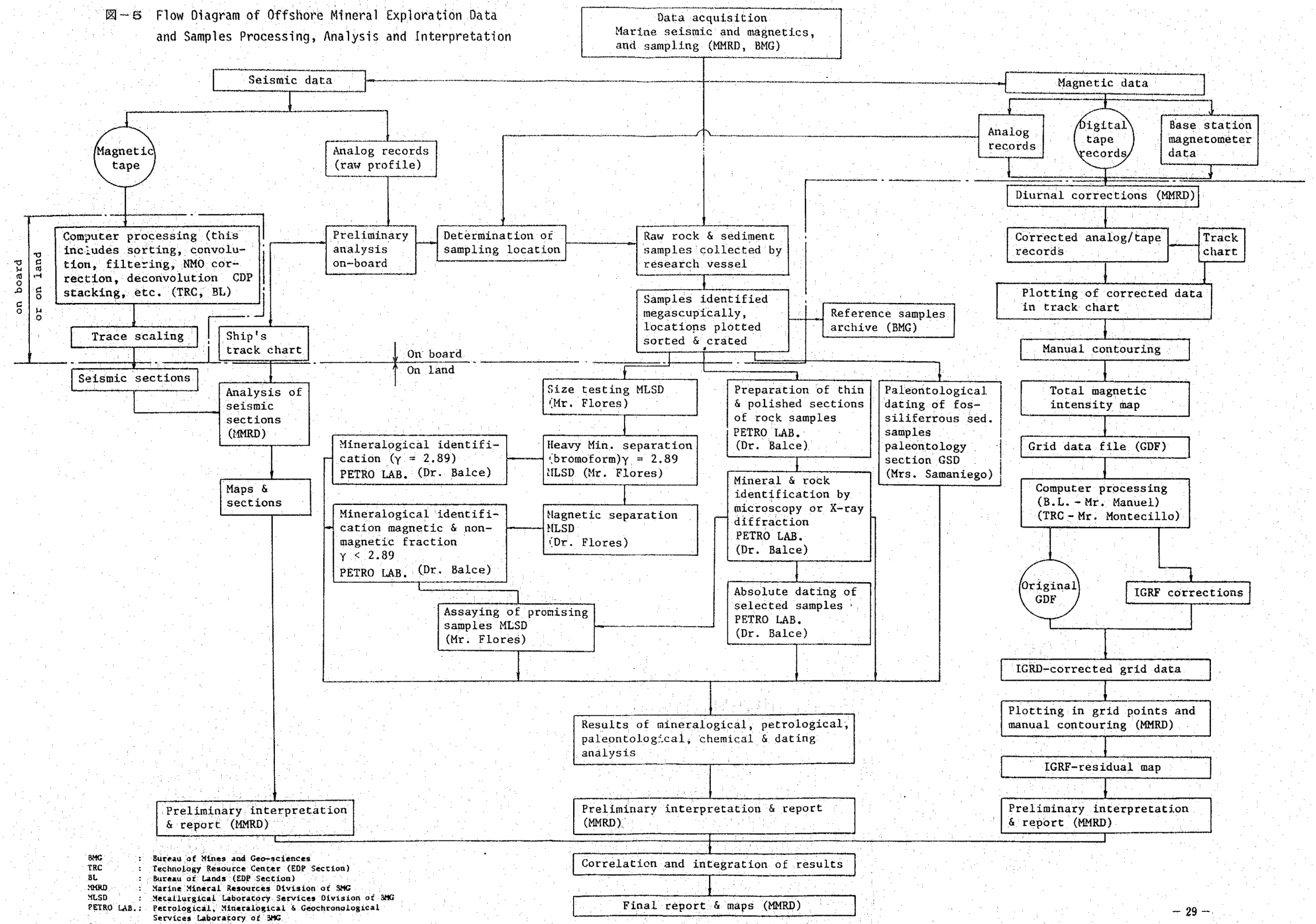
2－3　探査の長期計画

探査を行う海域はその附近の陸上の地質学上或は地球物理学の諸データより有望と推測できる海域１４を第１順位に選び，2,000年までのターゲットを計画しており，これを表－７に示す。

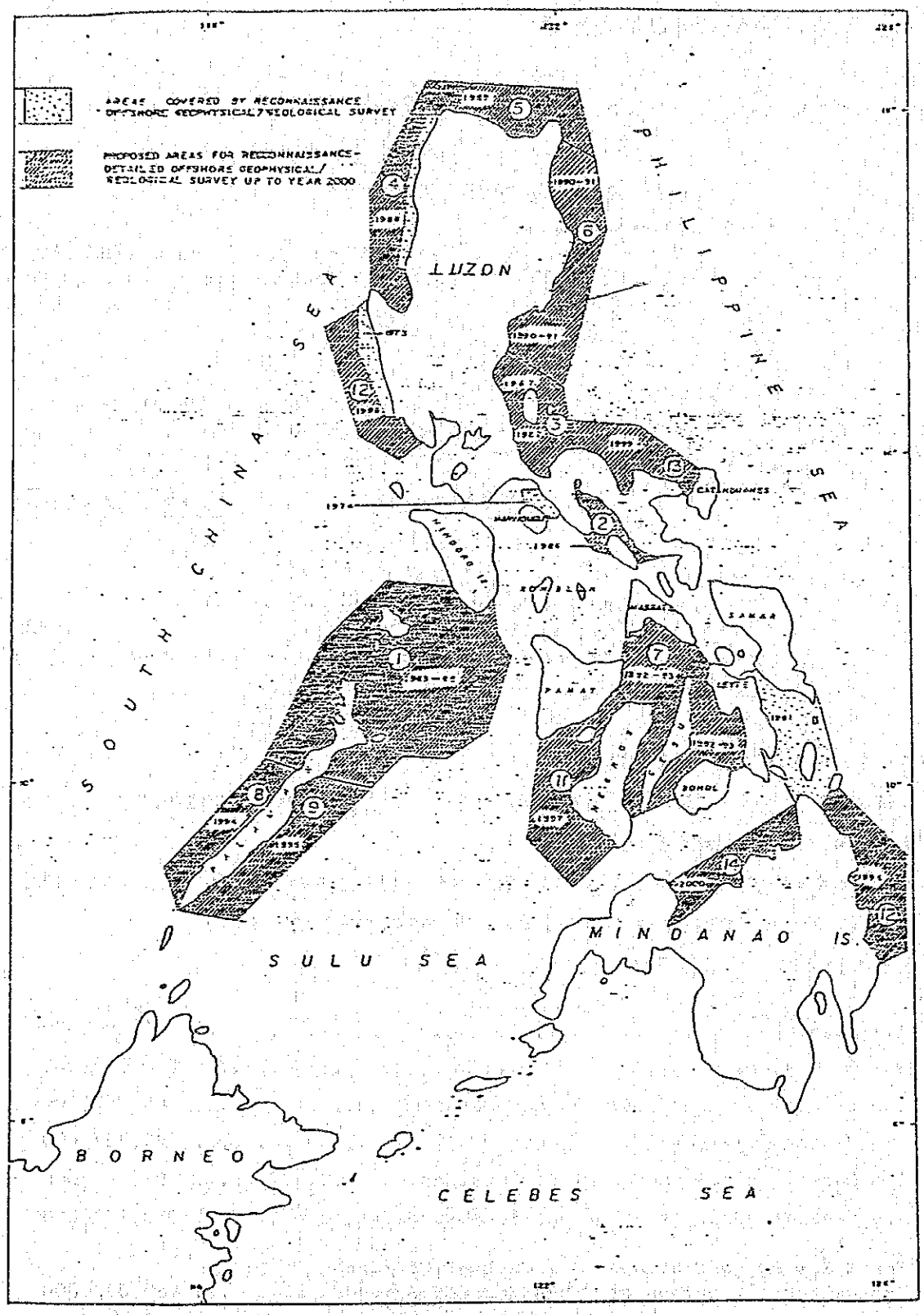
表－７　Target Dates for Exploration Survey

Area	Date of Exploration	Potential Mineral Deposits
1. Offshore Southern Mindoro-Palawan	1983 - 1985	Heavy Minerals (magnetite, ilmenite, chromite, hematite, gold), construction materials (gravel & 52nd), refractory mud, gemstones, hydrocarbon.
2. Lamon Bay, Quezon	1986	Same as above
3. Ragay Culf, Quezon	1987	Heavy Minerals (magnetite, ilmenite, chromite, hematite, gold)
4. Lingayen Gulf, Offshore Ilocos Region	1988	Same as above
5. Offshore Northern Luzon	1989	Same as above
6. Offshore Northeastern Luzon	1990 - 1991	Same as above
7. Visayan Sea	1992 - 1993	Heavy Minerals, Hydrocarbon gemstones, refractory mud
8. Offshore West Palawan	1994	Same as above
9. Offshore East Palawan	1995	Same as above
10. Offshore Eastern Mindanao	1996	Heavy Minerals (magnatite, ilmenite, chromite, hematite, gold)
11. Offshore Negros and Panay	1977	Heavy Minerals (same as above) hydrocarbon
12. Offshore Zambales-Bataan	1998	Heavy Minerals (magnetite, ilmenite, chromite, hematite, gold)
13. Offshore Southeastern Luzon	1999	Same as above
14. Offshore Northern Mindanao	2000	Same as above

図－5 Flow Diagram of Offshore Mineral Exploration Data and Samples Processing, Analysis and Interpretation



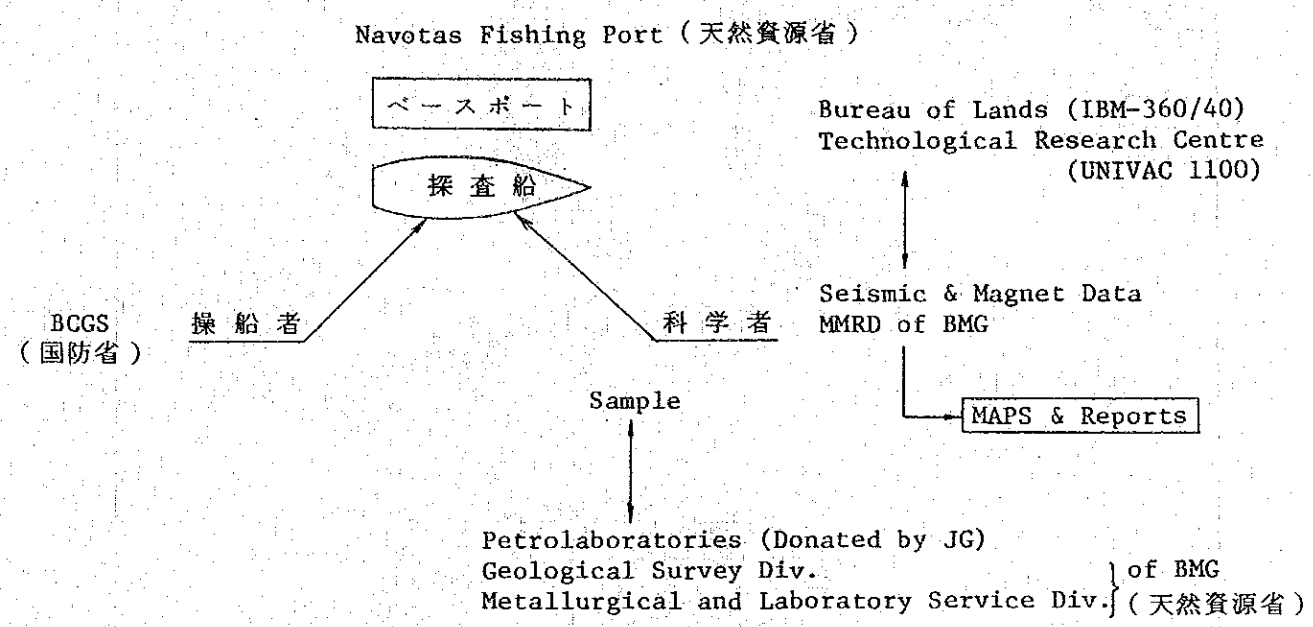
BMG : Bureau of Mines and Geo-sciences
TRC : Technology Resource Center (EDP Section)
BL : Bureau of Lands (EDP Section)
MMRD : Marine Mineral Resources Division of BMG
MLSD : Metallurgical Laboratory Services Division of BMG
PETRO LAB. : Petrological, Mineralogical & Geochronological Services Laboratory of BMG
GSD : Geological Survey Division of BMG



図－6 Map Showing Offshore Areas (1) Covered by Reconnaissance Offshore Geophysical/geological Survey and (2) Proposed Reconnaissance Detailed Geophysical/geological Survey of the Bureau of Mines and Geo-sciences

2－4　探査の組織および関連設備

探査の実施機関はＢＭＧであるが，これ以外にも多数の関連機関がある。



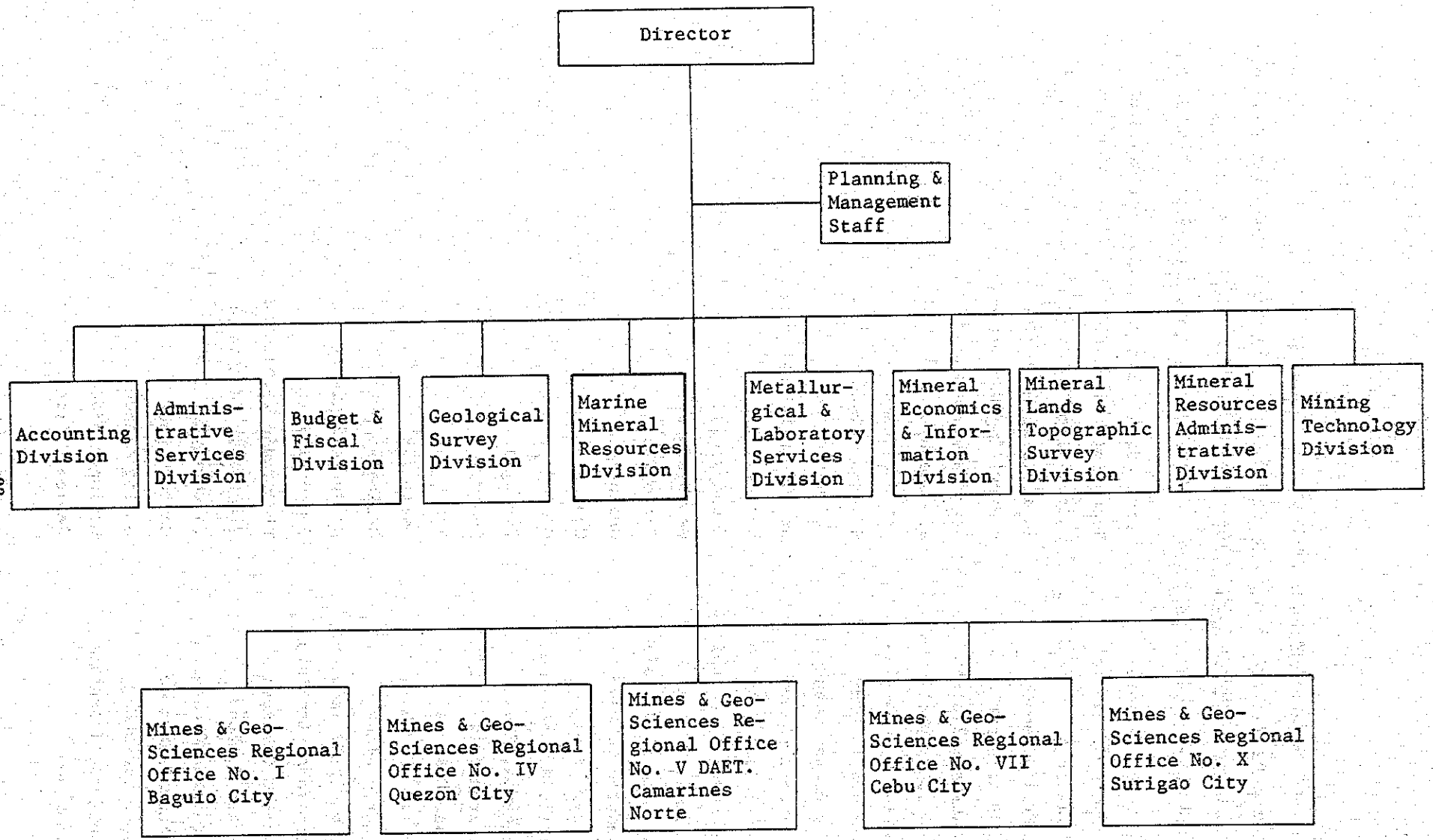
2－4－1　鉱山地球科学局（ＢＭＧ）

ＢＭＧは１０の部，５箇所の地方事務所からなり，総勢力1,300人（内鉱山技術者約６００人）の組織である。組織を図－７に示す。

1982年会計年度（１月～１２月）の予算は前年比約１２％の伸び率を示し，総額 63,072,000 ペソ（約１９億円）であり，その約５５％は地質調査費に充当されている。

下記に1982年度予算を示す。

1.1 Resarch	₱1,290,000
1.2 Geological Surveys	₱34,669,000
1.3 Mineral and Land Surveys and Management	₱4,152,000
1.4 Mining Services	₱9,357,000
1.5 Metallurgical and Chemical Services	₱3,486,000
1.6 General Administration and Support Services	₱10,128,000
Total New Appropriations (All Current Operating Expenditures), Bureau of Mines and Geo-Sciences	₱63,072,000



図－7　Organizational Chart

2－4－1－1　海洋鉱物資源部（MMRD）

本プロジェクトの探査はこの部の科学者たちによって船上での探査の実施がなされ，さらにデータの解析および判断もこの部が中心となって行われる。本プロジェクトに予定されている科学者は下記に示す３２名であり，外国の調査船にも幾度か乗船し経験を積んでいる。

◦ Carlos F. Teodoro	Chief, Marine Mineral Resources Division
◦ Salvador G. Martin	Supervising Geologist II
◦ Dominador A. Muriel	Supervising Geologist II
◦ Panfilo O. Montero	Supervising Geologist I
◦ Angel A. Bravo	Supervising Geologist I
◦ Leonardo Kalinisan	Sr. Mining Engineer
◦ Octavio C. Daclison	Sr. Geophysicist
◦ Edgardo V. Gonzales	Sr. Geologist
◦ Neoman dela Cruz	Sr. Geologist
◦ Jose R. Bustamante	Sr. Geologist
◦ Eduardo R. Nuevo	Sr. Geologist
◦ Macario del Rosario	Geophysicist
◦ Alexander M. Lacanilao	Geophysicist
◦ Wilfredo T. Icay	Geophysicist
◦ Reynaldo L. Villela	Geologist
◦ Leonardo C. Madayag	Geologist
◦ Anselmo Abungan	Geologist
◦ Danilo M. Octaviano	Geologist
◦ Renben M. Raval	Geologist
◦ Heliton delor Santos	Geologist
◦ Cesar Cabrera	Geologist
◦ Gerardo G. Abarquez	Geologist
◦ Eduardo Alforte	Geologist
◦ Herminio G. Taquiqui	Geodetic Engineer
◦ Rodolfo A. Bantista	Computer II
◦ Honcrio Cabanban	Electronic Technician
◦ Enrico B. Zuno	Electronic Technician
◦ Saturnino Camangonan	Cartographer I
◦ Arthur Cayamanda	Cartographer I
◦ Ramon Macabuhay	Geologic Aide
◦ Godofredo Tolentino	Geologic Aide
◦ Elmer Amo	Geologic Aide

2－4－1－2　地質調査部　（ＧＳＤ）

探査で収集されたサンプルはこのＧＳＤおよび日本から供与されたPetro Laboratories（１９８１年交換公文締結，１９８３年４月完工予定）で地質学的検討がなされる。科学者は2.3名。

2－4－1－3　冶金研究部　（ＭＬＳＤ）

サンプルについて冶金学的検討を行う。

2－4－2　沿岸測地調査所（ＢＣＧＳ）

航海用海図の作製等にたづさわっている機関であり，測量船も３隻所有し，乗組員の経験も豊かで，今回の探査実施に関しては，下記に示す乗組員２１名が参加することとなる。

Deck Officers

◦ Ceferino Pascual, Captain	Captain
◦ Renato B. Fier, Comdr	Chief Mate
◦ Jose Galo P. Isada, Jr. Lieut	2nd Mate
◦ Enrique A. Mascaspac Lieut	3rd Mate
◦ Basiliso Pebenito	Chief Radio Operator

Engine Officers

◦ Feliciano Y. Aguirre	Chief Engineer
◦ Jorge Caneto	2nd Marine Engineer
◦ Rogelio Ocampo	3rd Marine Engineer
◦ Teodoro Vidallo	3rd Marine Engineer

Deck Crew

◦ Renato Pamating	Chief Quarter Master
◦ Eugenio Terencio	Boatswain
◦ Rogelio Solis	Quarter Master
◦ Domingo Cortun	Seaman
◦ Apolonio Literano	Seaman

Engine Crew

◦ Vicente Penado	Marine Engineman
◦ Armando Sayong	Marine Engineman
◦ Antonío Pajarillaga	Marine Engineman
◦ Alvin Alim	Electrician
◦ Ruben Denaga	Machinist

Steward

◦ Apolinar Donor	Chief Steward
◦ Rolando Indoc	Asst. Steward

2—4—3 探査船の繋留地 Navotas

探査船のマニラに於ける繋留場所として，マニラの北方Navotas 港を予定している。

現在の港湾設備はアジア開発銀行（ＡＤＢ）の借かんにより日本の東洋建設（旧阪神築港）が建設したものであり，Fishery Development Authorityが管理の任にあたっている。（図－８参照）

〔陸上設備〕

Pier 1はDiesel Oil補油専用の桟橋で他は総て漁船用の桟橋で漁船が密集している。桟橋の幅は，各々自動車がすれ違えるぐらいの幅を有している。

補水はPier 1では可能であるが，他のPierではFootまで配水管が来ており，そこからHoseで補水が可能で，１時間２０～３０トンぐらいの能力がある。

給電設備については現状では不可能であるが1982年中にはPier 2から5まで可能となる予定である。陸電は２２０Ｖである。

探査船の引渡し時までには４４０Ｖの給電設備が完工，給電できるようになることがのぞましい。

桟橋の繋留設備については適当間隔にBitが配置され，防舷材も中古タイヤの２段束ねたものがBitの横に吊り下げられ，小型船の繋留設備として支障はない。

電話のConnectionは各Pierに設置されてあり，船内に電話を設けることは可能である。

Pier 2から5までのFoot 部は未だ空地となっており，将来，倉庫を建設する予定であり，その一部をＢＭＧ専用倉庫として使用できるようになる。調査の結果，陸上設備については問題はないと判断する。

〔港湾関係〕

防波堤：図－８に示すように南および西防波堤があり南および西からの風浪は遮えぎられる。小型漁船の停泊場所としては良好である。

防波堤の外はマニラ湾であり，水深は５ｍ以上（MLLW下 Mean Lower Low Water）確保されており，探査船のFull Draft 3.60ｍ＋0.6ｍ（ソナードーム）でも航行に支障はなく，防波堤の最狭部の幅は約１１０ｍあり，探査船の長さの約２倍あり問題はない。

水深：探査船のBerthは，現在Pier 3の先端南側を予定しており，防波堤の入口からBerthに至るまでの水深はBerthの前面に4.40ｍの個所もあるが，大略5.20ｍが確保されている。Berthの水深は5.50ｍが記録されており，探査船の吃水3.60ｍ＋0.6ｍからいって水深4.70ｍ以上なら航行には支障はないと判断する。

〔その他〕

暴風：マニラ附近は７月～９月にかけて台風の進路に当り，かかる漁船の密集した港では台風対策の早急かつ適当な港湾管理が望まれるわけで，襲来が予想される場合は早目に避難勧告を出し，各船がマニラ湾に錨泊する態勢が必要である。

盗難防止：漁船が密集し舷を並べて繋留するような現状では盗難防止に十分注意しなければならない。

補給品：当港に於ける補給品の価格等は次の通りである。

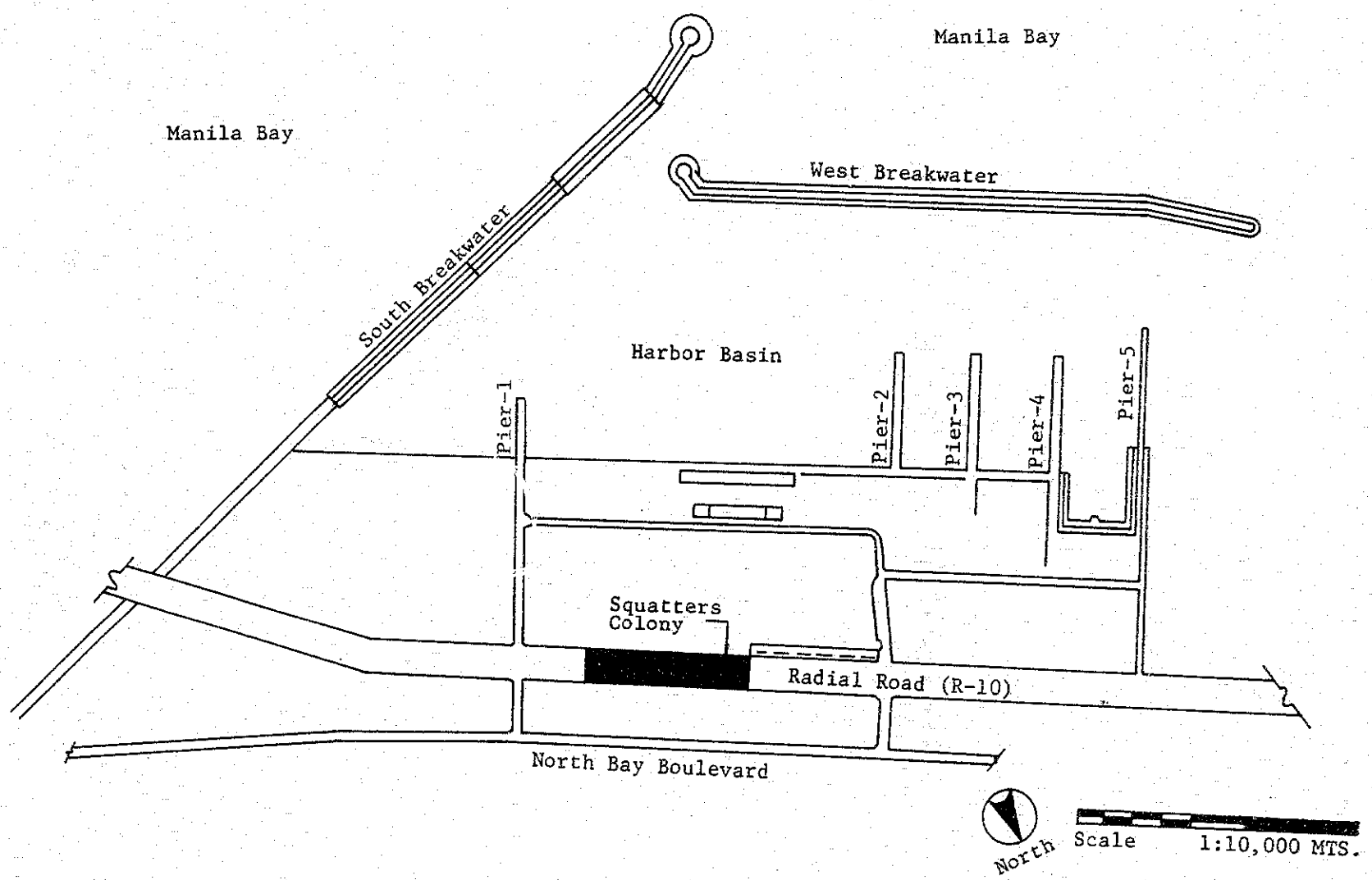
水　EX Pipe　₱ 6.00／TON

　　EX Barge ₱15.00／TON

Diesel Oil ₱ 3.11／liter＝3,110／KL

電気　　₱ 1.1　／KWH

バース使用料は6センターボ／G. TON／day であることが，確認されている。



Dagat Dagatan Development Project

図－8 Navotas Fishing Port Complex

第３章　探査船の基本設計

第３章　探査船の基本設計

３－１　基本方針

設計の基本方針としては

イ．船体の大きさは５００ＧＴ（日本政府トン数）型とする。

ロ．探査機器は探査目的に対して必要十分なものとする。

３－２　探査方式

地震反射探査方式としてアナログ方式とデジタル方式とを検討の結果，観測データを陸上に持ち帰って解析する際の有利性，また探査方式としての将来への永続性も考慮してデジタル方式を採用することとした。またサーベイボートは廃止し，上陸用舟ていと６人乗りサービスボートで代用することとした。

３－３　基本設計

詳細検討の結果基本設計の最終案を次に示す。

SPECIFICATIONS

OF

GEOPHYSICAL/GEOLOGICAL SURVEY VESSEL

1. General

The vessel to be designed and constructed as single screw, single rudder, twin diesel engine driven, long f'cle deck type geophysical/ geological survey vessel, and to be engaged in research at the sea of not more than 200ms depth within 200 nautical miles economical zone of the Republic of Philippines.

2. Classification

American Bureau of Shipping (A.B.S.) ✠A1 Ⓔ and ✠AMS.

3. Applied Rule

Rules and Regulations of the Classification Society

International Load Line Convention, 1966

International Tele-communication Convention (Radio Regulations)

International Convention for the Safety of Life at Sea, 1974 with exception of requirements on life boat

International Convention for the Prevention of Pollution from Ships, 1973

Inter-national Regulations for Preventing Collisions at Sea, 1972

Philippine Merchant Marine Rules and Regulations as applicable to government survey vessel

4. Flag

The Republic of the Philippines

5. Principal Particulars

Length, overall	abt. 53.5 m
Length, b.p.	45.00 m
Breadth, moulded	10.00 m
Depth, moulded	4.80 m
Designed fully loaded draught, moulded	3.60 m

Gross tonnage (By Japanese measurement rule)	abt. 500 tons
Deadweight at designed fully loaded draught 3.6 m	abt. 280 metric tons
Fuel oil tanks (100% full)	abt. 90 m^3
Fresh water tanks (100% full)	abt. 145 m^3
Water ballast tank (100% full)	abt. 15 m^3
Lubricating oil tank (100% full)	abt. 2 m^3

Trial speed at maximum continuous output of main engines, at about 20% deadweight condition with clean bottom in calm weather and smooth deep sea.

12.0 knots

Service speed on the designed fully loaded draught of 3.60 m, at 90% MCR of main engines with 15% sea margin.

abt. 11 knots

Endurance based on total fuel oil tank capacity and ship's speed of 11 knots.

abt. 4,200 nautical miles

Navigating period to be 30 days at sea including 7 days at service speed about 11 knots and 23 days at survey speed about 6 knots.

Complement	Officer	9
	Crew	12
	Scientist	9
	Guest	1
	Total on board:	31 persons

6. Material and Workmanship

Steel and other material, machinery and equipment to be Japanese make and in accordance with Classification Society Requirement in general.

7. Hull Construction

The vessel to be constructed of steel, and electric welding to be adopted for the entire hull structure.

The scantling to be in accordance with the Classification Society Requirements.

8. Painting

Steel plates and bars to be prepared by shotblasting and coated with long exposure type primer.

Painting scheme to be as follows:

Outer shell below water line	A/C	2-coat
	A/F	2-coat
Outer shell above water line	A/C	2-coat
	Finish paint	2-coat
In board	A/C	2-coat
	Finish paint	1-coat
Deck house	A/C	2-coat
	Finish paint	2-coat
Deck	A/C	2-coat
	Finish paint	1-coat

9. Cathodic Protection

Suitable number of aluminum alloy anode to be fitted.

10. Hull Equipment

10.1 Deck Machinery

Steering gear	Electro-hydraulic ram type with two (2) pump units, one (1) act as a stand-by	
	2.5 T-M	1 set
Windlass	Electric driven with two (2) gypsy wheels and two (2) warping heads	
	4.5 T x 9 M/Min.	1 set
Mooring capstan	Electro-hydraulic driven vertical shaft, one (1) warping head type	
	2.0 T x 15 M/Min.	1 set
Bow thruster	Electric driven with controllable pitch propeller, abt. 2T thrust	
		1 set

Deck crane	Hydraulic driven, slewing and luffing type	
	2.0T x 10M max. radius	1 set
Hydraulic power unit	Electric-motor driven for capstan, deck crane and winch.	1 set
	(Note: Each machinery not to be operated simultaneously)	

10.2 Life Saving Equipment

2 - Life rafts for 20 persons
31 - Life jackets
8 - Life buoys
6 - Rocket signals
12 - Parachute signals
4 - Self-igniting lights
3 - Self activating smoke signals
1 - Life line throwing apparatus

10.3 Fire Fighting Equipment

CO_2 fire extinguishing system for engine room.

Fire hydrant system for accommodation space according to the Classification Society requirements.

10.4 Air-Conditioning System and Ventilation

Two (2) sets of air-conditioning machines to be installed to serve as ventilation and/or cooling.

One (1) of them to be served for all cabins, public rooms and duty rooms.

The other to be served for measuring room, draft room and wet laboratories.

The system to be low velocity, single duct system and designed to meet following conditions.

	Outside air		Inside air		Sea water Temp.
	Temp.	R. Humid	Temp.	R. Humid	
Summer	35°C	65%	28°C	abt. 50%	32°C

Necessary mechanical ventilation and natural ventilation to be fitted.

10.5 Refrigerated Provision Chamber

Following refrigerated provision chamber to be provided.

	Volume (m^3)	Maintained Temp. (°C)
Meat and Fish	abt. 8.5	- 12
Vegetable	abt. 5.5	+ 2
Lobby	abt. 4	-
Total:	abt. 18	

10.6 Window, Hatch and Door

All windows to be of Al-alloy frame with reinforced glass.

All hatches to be of steel with hinge up type covers having rubber gaskets and clampings.

Heavy weathertight or weather-tight steel doors to be fitted to the weather exposed entrances of living quarter and other compartments on the upper deck and f'cle deck.

Wooden sliding doors covered by F.R.P. to be provided for wheel house.

10.7 Anchors, Cables and Mooring Ropes

2 - Bower anchor stockless		900 Kg each
1 - Spare anchor stockless		900 Kg
1 - Anchor chain cable with stud		26 MMø x 357.5 M
1 - Towing rope	steel	24 MMø x 180 M
4 - Mooring rope	nylon	24 MMø x 140 M

10.8 Accommodation and Laboratories

As per attached plan.

11. Machinery

11.1 Main Engine

Type	:	Air started, 4 cycle, single-acting trunk piston, turbocharged and inter-cooled non-reversible fresh water cooling diesel engine
No. of set	:	Two (2)
Maximum continuous output	:	Not less than 600 ps
Revolution at MCR	:	Not more than 900 rpm
Fuel oil	:	Diesel fuel oil (Japanese A heavy oil)

11.2 Main Reduction Gear

Type	:	Non-reversible reduction gear, with hydraulic multiple disc type clutch
No. of set	:	One (1)
Maximum transmitting output	:	Not less than 1200 ps
Gear ratio	:	Approx. 900/320

11.3 Shafting and Propeller

Intermediate shaft	:	One (1)
Propeller shaft	:	One (1)
Propeller	:	One (1) set Three or four bladed controllable pitch type Material: Aluminum bronze
Stern tube	:	Fabricated and welded steel construction type with reinforced rubber bearing

11.4 Electric Generating Plant

1) Main generator

Type	:	Drip-proof, self-ventilating, brushless type
No. of set	:	Two (2)
Capacity	:	Approx. 140 KW, 445 V, A.C., 60 Hz, 3ϕ

2) Main generator diesel engine

Type	:	Air started, 4 cycle, single-acting trunk piston turbocharged and inter-cooled fresh water cooling diesel engine
No. of set	:	Two (2)
Capacity	:	Approx. 220 ps x 1,200 rpm

3) Emergency/port generator

Type	:	Drip-proof, self-ventilating, brushless type
No. of set	:	One (1)
Capacity	:	Approx. 30 KW, 445 V, A.C., 60 Hz, 3ϕ

4) Emergency/port generator diesel engine

Type	:	Electric started, 4 cycle, single-acting trunk piston, radiator cooling diesel engine
No. of set	:	One (1)
Capacity	:	Approx. 50 ps x 1,800 rpm

11.5 Pumps

* M/E reserve cooling fresh water pump	Motor driven centrifugal 25 m^3/h x 20 m	1 set
Cooling sea water pump for shafting system	Motor driven centrifugal 15 m^3/h x 20 m	1 set
Sea water service pump	Motor driven centrifugal 60 m^3/h x 25 m	1 set
Bilge/ballast pump	Motor driven centrifugal 30/60 m^3/h x 35/25 m	1 set
Fire/general service pump	Motor driven centrifugal 30/60 m^3/h x 35/25 m	1 set
Sanitary pump	Motor driven centrifugal 5 m^3/h x 35 m	1 set
Fresh water pump	Motor driven centrifugal 3 m^3/h x 35 m	1 set
Oily bilge pump	Motor driven piston 0.5 m^3/h x 25 m	1 set
* M/E reserve lub. oil pump	Motor driven gear 7.5 m^3/h x 6 kg/cm^2	1 set
* Main R/G reserve lub. oil pump	Motor driven gear 9 m^3/h x 18 kg/cm^2	1 set
Main fuel oil transfer pump	Motor driven gear 5 m^3/h x 2.5 kg/cm^2	1 set
Aux. fuel oil transfer pump	Motor driven gear 3 m^3/h x 2.5 kg/cm^2	1 set

Note: The capacity of * marks pumps are subject to modification in accordance with main engine manufacturer's recommendation.

11.6 Air Compressors, Fans and Air Reservoirs

Main air compressor	Motor driven 6 m^3/h (F.A.) x 30 kg/cm^2	2 sets
Emergency air compressor	Diesel engine driven 4.5 m^3/h (F.A.) x 30 kg/cm^2	1 set
Air compressor for water gun	Motor driven 40 $ft^3/min.$ (F.A.) x 1,500 psi.	2 sets
Engine room ventilating fan	Motor driven axial flow 200 $m^3/min.$ x 30 mmAq	2 sets
Main air reservoir	150 liters x 30 kg/cm^2	2 sets
Aux. air reservoir	100 liters x 30 kg/cm^2	1 set
Air reservoir for water gun	50 liters x 1,500 psi	2 sets

11.7 Miscellaneous Machinery

Oily bilge separator	Gravity type 0.5 t/h	1 set
Lub. oil purifier for main engine	Motor driven disc bowl Approx. 700 ℓ/h	1 set
Lath	Motor driven Center distance : 650 mm	1 set
Drilling machine	Motor driven Drill dia.: abt. 13 mm	1 set
Grinder	Motor driven dia.: 200 mm	1 set
Electric welder	A.C. 300 amp.	1 set
Gas welder set	Oxygen-Acetylene 40 ℓ bottle one each	1 set
Air horn	85 mmφ	1 set

11.8 Engine and Propeller Control System

Control of start-stop of main diesel engines to be made at engine side in engine room.

Control of revolution of main diesel engines to be made at engine side in engine room and also to be remote control from the wheelhouse.

Control of reduction gear clutch on-off to be made at gear side in engine room, and also clutch off to be remote control from wheelhouse.

Propeller pitch to be controlled from wheelhouse and at oil distribution box in engine room.

12. Electric

12.1 System of Supply

Distribution system and their voltage to be as follows:

Item	Voltage	Frequency	Phase	Conductor
Generator	445 V a.c.	60 Hz	3 ϕ	3 wire
Power motor	440 V a.c.	60 Hz	3 ϕ	3 wire
Do. (Fractional power motor)	220 V a.c.	60 Hz	3 ϕ	3 wire
Radio, communication & nautical equipment	220 V a.c. or	60 Hz	1 ϕ	2 wire
	24 V d.c.	-	-	2 wire
Lighting	220 V a.c.	60 Hz	1 ϕ	2 wire
Battery light	24 V d.c.	-	-	2 wire

If 100 V a.c. is required as electric sources according to manufacturer's standard, 220/100/110 V transformer to be provided.

12.2 Transformer

	For general service	For emergency service
Type	Drip-proof, self-cooled dry type	
No. of set	Three (3)	Three (3)
Output & voltage	15 kVA x 445/225 V	5 kVA x 445/225 V

12.3 Battery

Type : Lead acid type

No. of set : One (1) set

Capacity : 24 V x 300 AH (at 10 hours rate)

12.4 Shore Connection Box

One (1) set of 440 V A.C., 60 Hz, 3 phase, 100 amperes, drip-proof type shore connection box.

12.5 Electric Lighting

In general, application of lighting fixtures to be as follows:

Fluorescent type	:	Cabins, public rooms, inside passage ways, main part of engine room
Incandescent type	:	Other spaces

12.6 Electric Interior Communication Equipment

1 set - Common battery telephone
(3 point, 4 point and 8 point system)

1 set - Engine order telegraph (Lamp type)

1 set - Electric propeller shaft tachometer

1 set - Clock

1 set - Public addressor (Output 50 W)

1 set - Rudder angle indicator

12.7 Electric Nautical Equipment

1 set - Gyro compass and auto pilot

1 - Master compass

5 - Repeater compass

1 - Steering stand

1 set - Navigation echo sounder

1 - Recorder

1 - Transducer

Oscillation frequency : 200 kHz

Max. depth range : 400 m

1 set - Radar (Relative motion)

1 - Display unit (dia. 12", 64 n. mile)

1 - Transceiver

1 - Scanner (abt. 7 ft.)

Wave length : 3 cm

Peak transmitting output : 25 kW

1 set - Radio direction finder

1 - Receiver

1 - Loop antenna

1 set - Electro magnetic log

1 - Log mechanism

1 - Speed distance transmitter

1 - Speed indicator

1 set - Wind speed & direction meter

1 - Transmitter

2 - Wind speed & direction indicator

12.8 Radio Equipment

1 set - SSB radio telephone

1 - Transmitter (Output max. 400 W)
Type of emission: A1, A3A, A3H, A3J

1 - Receiver

1 - Exciter

1 - Power supply

1 set - Antenna equipment

1 set - VHF radio telephone

1 - Transceiver
25 watt, 150 MHz, 61 Ch. F3

1 set - Antenna equipment

1 set - Portable radio apparatus for emergency use

4 sets- Landing/survey boat VHF transceiver

13. Survey Equipment

It is to be understood that the following specifications are examples of possible selection of the survey equipments and may be altered in a part or whole, subject to approval of the owner or the owner's representative of the vessel, provided the function of each equipment is equivalent or more to those stipulated herein for the purpose intended.

13.1 Integrated Navigation/Data Acquisition System

The outline of the specification of the system is as follows.

(1) NNSS Receiver (1 set)

a. Satellite positioning

b. Dead reckoning

c. Voyage calculation

d. Alert calculation

e. Re-calculation of post satellite data

f. Output of item a, b and e above

(2) Electronic positioning fixing system (1 set)

a.	Maximum range	80 km (line of sight distance)
b.	Range display	99999.9 m (Dual display in six digits)
c.	Range resolution	0.1 m
d.	Range accuracy	Normal one meter or less
e.	Multi-range performance	Simultaneous measuring of three different ranges

(3) Doppler sonar (1 set)

a.	Ship speed	Forward 20.0 kt, Backward 10.0 kt, Right-left 9.9 kt
b.	Depth range	15～300 meters
c.	Frequency	130 kHz
d.	Remote display	Speed indicator x 1, Distance indicator x 1

(4) Computer unit (1 set)

Composition

a. CPU

b. Floppy disk

c. 5 MB disk

d. Graphic CRT display

e. Keyboard

f. Adapter, etc.

Performance

a. Multi accuracy calculation

b. Graphic display control

c. Control of inputs/outputs

(5) Magnetic tape unit (1 set)

a.	Tape speed	27 IPS
b.	No. of track	9
c.	Recording density	1,600 BPI
d.	Recording system	PE
e.	Length of tape	1,200 ft (half reel)

(6) Interface (1 set)

Control of various input/output signal by microprocessor

(7) Software (1 set)

a. Conversion from R/R of positioning data to B.L.

b. Examination of the position of land station by NNSS

c. Processing of NNSS position data for higher accuracy of ship's position

(8) Printer (1 set)

a.	Printing method	Dot matrix
b.	Printing speed	200 letters/sec.
c.	No. of letter per line	136 letter/line
d.	Width of paper	15 inches

(9) X-Y Plotter (1 set)

a.	Paper size	Ao size
b.	Flat bed type	

(10) Remote CRT display (1 set)

a. Sixteen letters, eight column 9 inch display

b. Desk top type or rack-mount type

Fig. 1 Integrated Navigation/Data Acquisition System
(Example of System Composition)

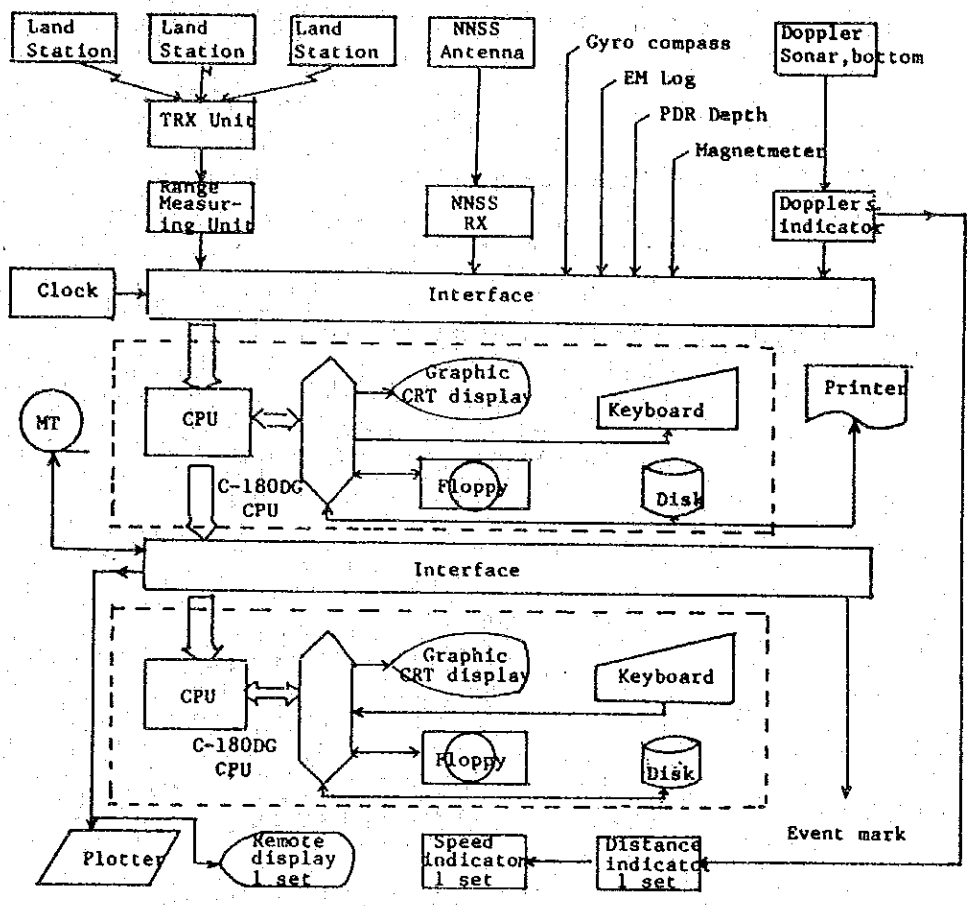
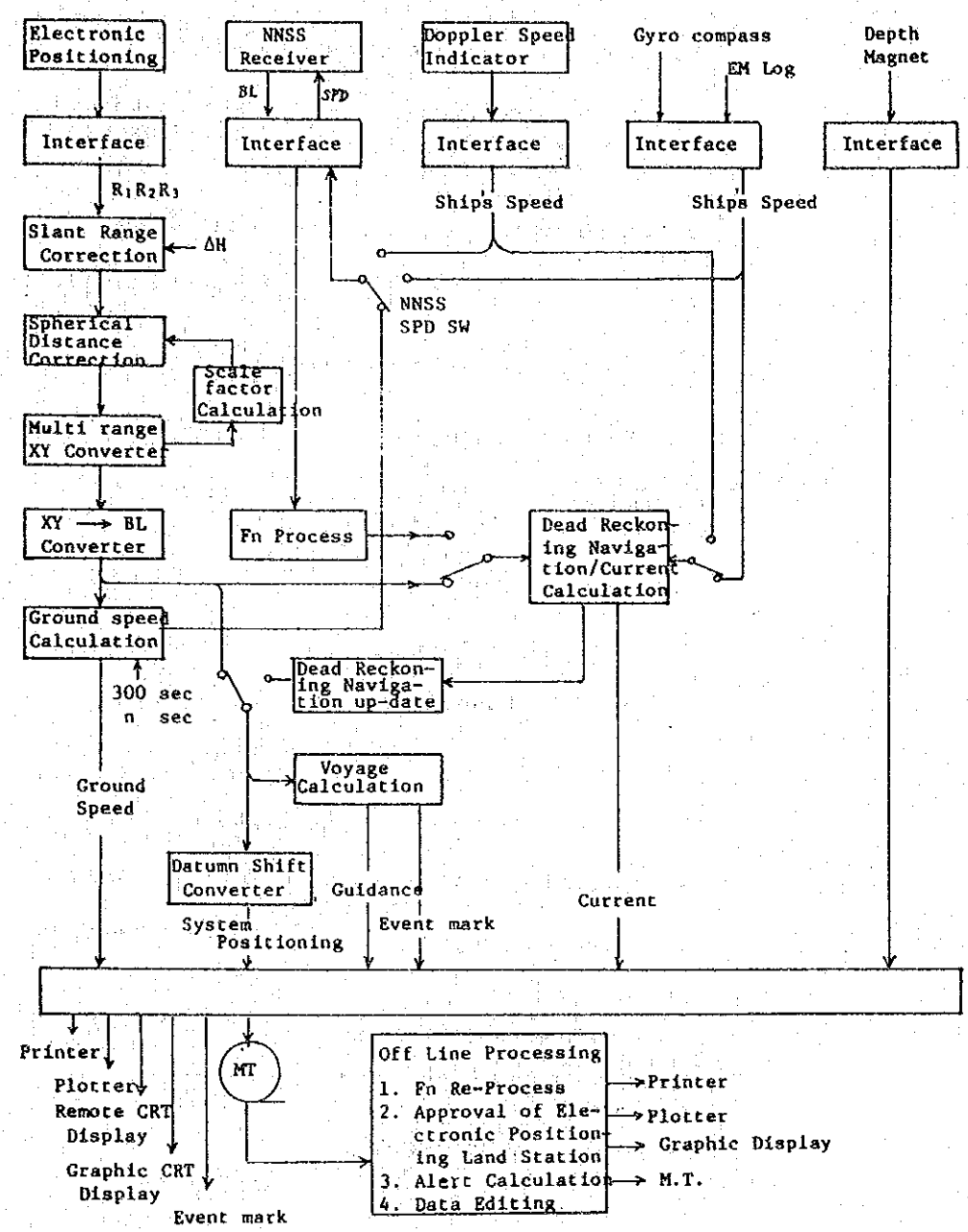


Fig. 2. Integrated Navigation/Data Acquisition System
(Example of Data Process Flow)



13.2 Multichannel Seismic Reflection System

(1) Streamer cable

a.	Active section	50m/12 channel or 25m/24 channel
b.	Depth/Distance section	3 channel
c.	Stretch section	25m x 3 section
	Dead section	25m x 2 section
d.	Lead-in section	150m
e.	Tail section	Light Buoy
f.	Winch	Electric or Electro-hydraulic

(2) Water gun

a.	80 Cubic inch	1 unit
b.	15 Cubic inch	2 units

(3) Data acquisition

a.	Sampling interval	0.5 ms, 1 ms, 2 ms, 4 ms
b.	No. of channel	12 channel
c.	Record length	5 sec.
d.	Tape format	SEG-B or SEG-X
e.	Off line processing	Format change, stacking
f.	Support program	Editor, Fortran compiler, Commands

(4) Data processing system

a. CDP gather

b. Velocity analysis

c. NMO correction

d. CDP stacking

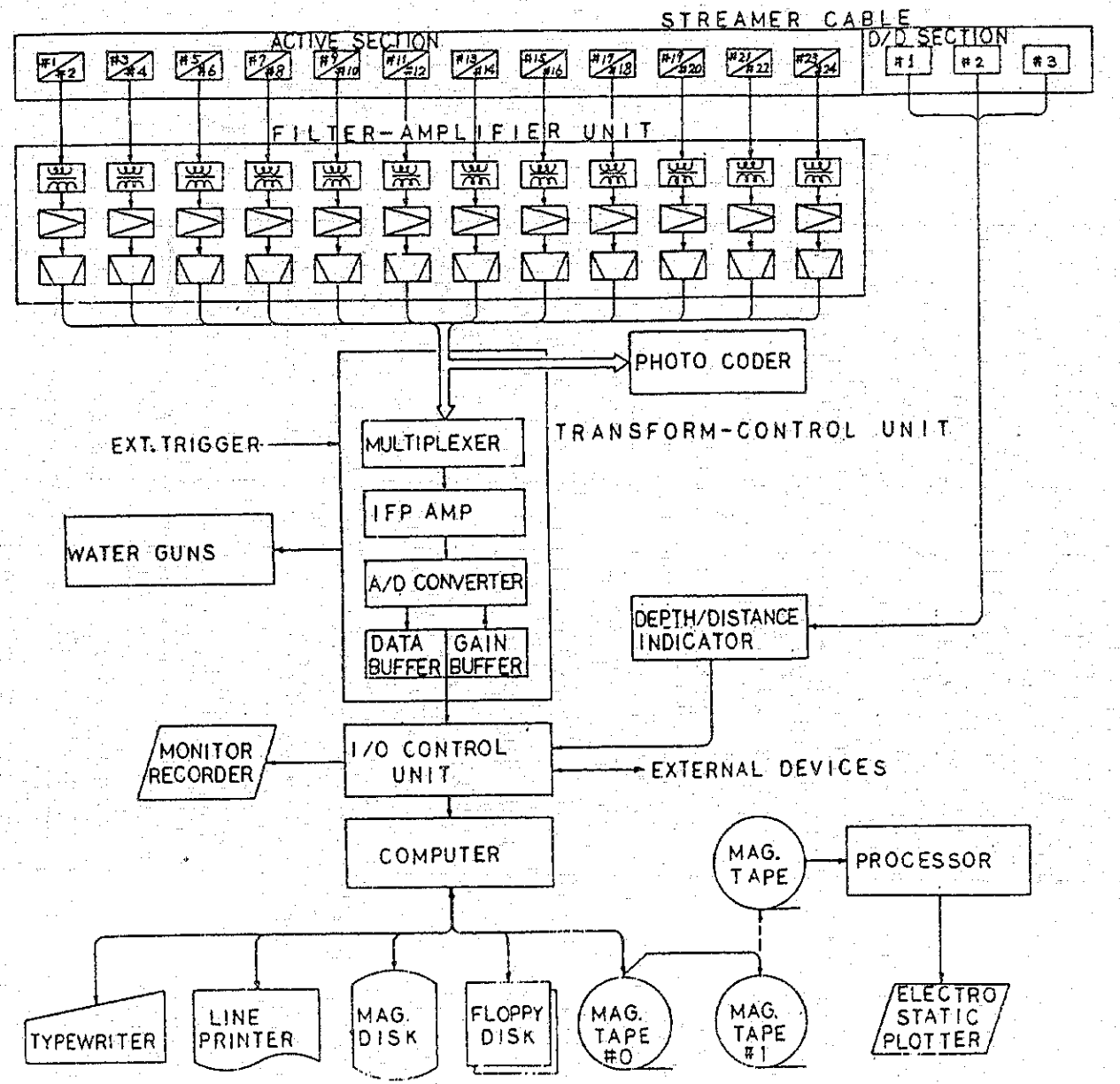
e. Deconvolution

f. Filtering

g. Electrostatic plotter display

NO	ITEM	Q'TY	NOTES
1	STREAMER-CABLE		
-1	ACTIVE SECTION	24	25m/ch
-2	D/D SECTION	3	
-3	STRETCH SECTION	3	25m/ch
-4	DEAD SECTION	2	25m/ch
-5	TAIL SECTION	1	w. light buoy
-6	LEAD-IN SECTION	1	150m
-7	WINCH	1	electric
2	WATER GUN		
-1	S.80	1	
-2	S.15	2	
-3	CONTROLLER	1	
3	DATA AQUISITION		
-1	FILTER-AMPLIFIER	1	
-2	TRANSFORM-CNTL.	1	
-3	I/O CNTL.	1	
-4	COMPUTER	1	
-5	TYPEWRITER	1	
-6	LINE PRINTER	1	
-7	MAG. DISK	1	
-8	FLOPPY DISK	1	2 drives
-9	MAG. TAPE	2	
-10	D/D INDICATOR	1	
-11	RECORDER	1	
-12	PHOTO CODER	1	
4	DISPLAY		
-1	MAG. TAPE	1	
-2	PROCESSOR	1	
-3	E SP	1	
5	ACCESSORIES		
-1	DC POWER SPLY.	1	
-2	TOOLS	1	MAKER'S STD.
-3	EXPENDABLES	1	MAKER'S STD.
6	SPARE PARTS	1	MAKER'S STD.

FIG. 3. EXAMPLE OF MULTI-CHANNEL SEISMIC PROFILING SYSTEM



13.3 Survey Echo Sounder (1 set)

a.	Power supply	115 V.a.c. or 100 V.a.c. 50 ∿ 60 Hz
b.	Directional width	(-3 db) 15°
c.	Range	200, 400, 800, 1 000, 2 000, 4 000, 6 000, 8 000 m
d.	Line density	30, 45, 60, 90 line/cm
e.	Recording data	486 mm x 60 m
f.	Frequency	12 kHz (± 10%)

g. Digitizer

Digitizer converts analog echo signal into digital depth data format for numeric display and data/output to shipboard system.

1. Number of figure 5/digit
2. Max. range 0 ∿ 19,999 m
3. Time gate control

   Automatic bottom tracking
4. Depth data (output)

   BCD code

13.4 Proton Magnetometer (1 set)

a.	Measuring range	20,000 ∿ 100,000 gammas
b.	Sensitivity	1 gamma
c.	Accuracy	± 0.5 gamma
d.	Measurement interval	3.6 sec.
e.	Output	Digital signal BCD Cord TTL Level
		Analog signal 0∿99, 0∿990 gamma
f.	Operating voltage	24V DC
g.	Sensor	Troidal coil

h.	Tow cable	220 m abt. ϕ20 mm
i.	Winch	Electro-hydraulic

13.5 Bottom Sampler

a.	Piston core sampler	(2 pcs.)
	Sampler tube	SUS abt. 76.3ϕ x abt. 67.9ϕ mm
	Inner tube	Plastic abt. 65ϕ x abt. 60ϕ mm, 4m
	Weight	40 kg x 10 pcs. (Max.)
b.	Gravity core sampler	(2 pcs.)
	Sampler tube	SUS abt. 101.6ϕ x abt. 93.6ϕ mm
	Inner tube	Plastic abt. 90ϕ x abt. 84ϕmm, 3m
	Weight	40 kg x 10 pcs. (Max.)

13.6 Scuba Diving Gear

(1) Six (6) sets to be provided, each set consisting of:

1 - Tank block 12 liters, 150 kg/cm^2

1 - Regulator

1 - Aqua sea gauge

1 - Mask

1 pair - Fins

1 - Dive knife

1 - Wet suit

1 pair - Aqua boots

1 - Weight belt

1 - Bag

1 - Snorkel

1 - Flash light

(2) 1 Set of Electric motor driven portable air compressor

13.7 Survey Winch

1 - Sampling winch for handling core samplers at the sea top to 200 m depth (3,000 m x 9 mmϕ)

13.8 Boat

1 - Landing/Survey boat, abt. 5 M length, steel construction with engine

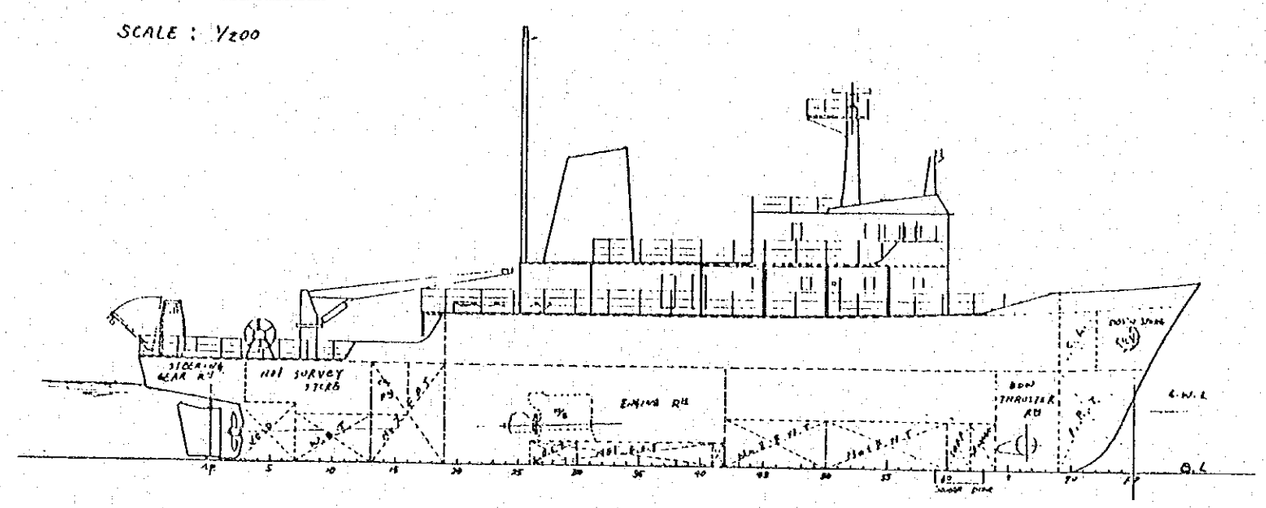
1 - Boat davit for Landing/Survey boat

1 - Service boat, for six (6) persons with out-board engine

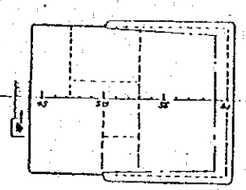
1 - Inflatable rubber boat, abt. 4 M length with out-board engine

GENERAL ARRANGEMENT PLAN

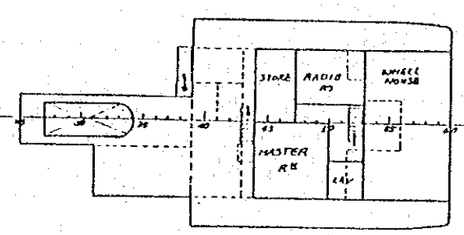
SCALE : 1/200



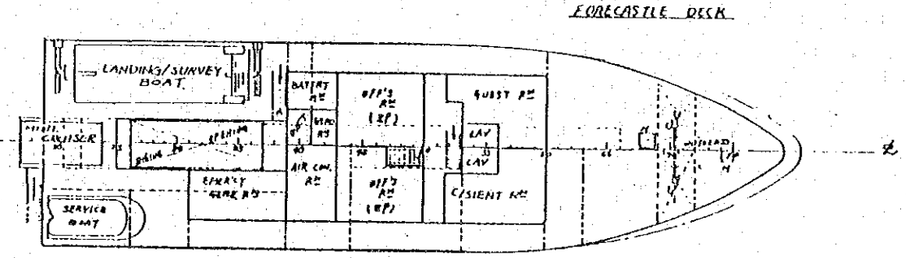
COMPASS BRIDGE DECK



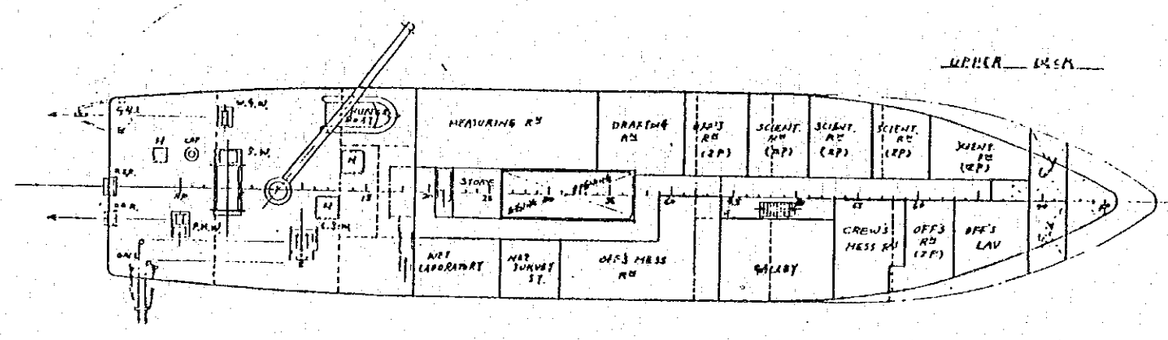
NAV. BRIDGE DECK



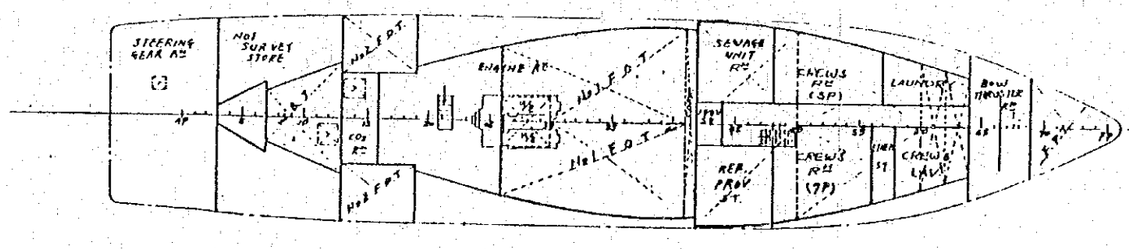
FORECASTLE DECK



UPPER DECK



TANK TOP



第４章　探査船の建造計画

第４章　探査船の建造計画

４－１　建造工程

計画探査船の建造工程は次のとおりである。

月	工　　程
×	交換公文
1	コンサル契約
2	入札資料作成
3	
	承認
4	入札公示
	入札
5	エバリュエーション
6	建造契約
7	
8	
9	
10	
11	
12	
13	起工
14	
15	
16	進水
17	
18	
19	
20 ○	現地引渡し

4－2　建造費概算

探査船および観測機器の費用の概算は次のとおりである。

探査船	1,989,000,000円
（内観測機器　購入費	530,000,000円）
予備費	76,000,000円
コンサルタント費	75,000,000円
総　計	2,140,000,000円

4－3　建造体制

計画探査船は，基本計画でわかるように，設計およびその建造にあたっては，高等な技術を要求される内容である。したがって，これらの内容に対応できる造船所で建造することがのぞましい。

また，探査船に設備する探査機器においても造船所において調達することが，建造工程をより確かにし，完成後の機器および船に対する責任体制も造船所に一本化され，引渡し後の維持管理にものぞましい結果となろう。

第５章　運営，維持管理計画

第５章　運営，維持管理計画

５－１　運営・維持管理体制

本プロジェクトの取りまとめ責任者は，海洋鉱物資源部（MMRD）の部長MR．TEODOROであり，鉱山地球科学局（ＢＭＧ）の局長の直接の指揮管理を受ける。BCGSから派遣される乗組員および乗船科学者も彼の管理下におかれ，また船の運航維持管理も彼の責任のもとにＢＭＧの担当部を使って運営を行う計画である。

５－２　探査船の運営・維持管理費用

ＭＭＲＤで行った運航費の試算表を次に示す。ここでは年間19,800万円（６６０万ペソ）程度と見ているが，これ以外に下記を考慮する必要がある。
外に下記を考慮する必要がある。

(1) 船員費はＢＣＧＳ負担となっているが，プロジェクトとしては，これを加える必要があり約1,140万円（約38万ペソ）と入手した船員給与資料より推算する。さらにＢＭＧより航海手当として支給する分として約１９５万円（約 6.5 万ペソ）。合計約1,350万円（45万ペソ）を見る必要がある。

(2) ドライドック，日常補修費用，船の保険料はSupplies and Othe Expeuses の約１２６万ペソに含まれるものと推定する。

(3) 調査団で試算したものをページ７５に示す。これでは年間15,000 万円（５００万ペソ）程度となる。ＭＭＲＤ案との大きな相違は燃料費でＭＭＲＤ試算の約６０％で済むものと推定される。

Budget Estimate for the Vessel Operation 1984

Personnels and Staff		
Salaries and allowances		
1 Supervising Geologist II		₱35,928.00
1 Supervising Geologist I		33,780.00
2 Sr. Geologist		57,672.00
1 Sr. Geophysicist		28,836.00
1 Sr. Mining Engineer		31,836.00
2 Geologist		52,488.00
1 Mining Engineer		25,044.00
1 Electronic Engineer		25,044.00
4 Survey Aides		48,960.00
	Total	₱339,588.00
Salary Adjustments		33,958.80
Traveling and Transportation Expenses		68,349.00
	Total	₱441,895.80
POL Products		
1.5 m Diesel Gasoline		₱4,009,500.00
150 Drums Oils		335,625.00
16 Drums Hydraulics		4,199.60
50 Drums Regular Gasoline		53,455.50
	Total	₱4,402,780.10
102 Inflationary Adjustment		565,992.10
Supplies and Other Expenses		1,257,141.00
GRAND TOTAL		₱6,667,809.10

CARLOS F. TEODORO
Chief, Marine Mineral Resources Division

NOTE: Salaries and allowances of the officers and crew are included in the budget of the Bureau of Coast and Geodetic Survey.

調査団による運航費試算

船員費	約	1,329万円	(₱ 443,292)
技術者費	〃	1,017万円	(〃 339,588)
旅費及輸送費	〃	480万円	(〃 160,000)
船用品費	〃	240万円	(〃 80,000)
清水費 1日7TON消費	〃	45万円	(〃 15,330)
修繕費 ドック12日	〃	300万円	(〃 100,000)
一般修理費	〃	90万円	(〃 30,000)
燃料費 (約700T)	〃	7,710万円	(〃 2,565,750)
雑用油	〃	156万円	(〃 51,470)
Navotas港費	〃	3万円	(〃 900)
同電気代	〃	45万円	(〃 15,000)
保険料	〃	3,000万円	(〃 1,000,000)
合計	〃	14,415万円	(〃 4,801,330)

余分をみて15,000万円(₱ 5,000,000)みれば通常の年間探査費として十分ではないかと考えられる。

5－3 探査データ解析費用

探査で得たデータの陸上での解析費用の概算を次に示す。

5－3－1 海中磁気および地震反射のマグネットテープから10万の1或は25万の1の地図作成までの費用は各100 Magnet tapes に対し約77万ペソとBMGでは算定している。

5－3－2 収集サンプルの解析費用は100個のサンプルに対し約15万ペソと算定している。上記詳細は次に示す。

MARINE MAGNETIC DATA PROCESSING AND INTERPRETATION

DETAILS OF COST ESTIMATE

1. Cost of 100 Magnetic Tapes, for Original Data

Specification: 9 - Track, 1600 BPI, 2400 ft.
Canister - ₱265.00
Tape seal belt - ₱245.00
₱510.00

₱510 × 100 = ₱51,000

TOTAL COST OF MAGNETIC TAPES = ₱102,000

2. Computer Usage Fee

A) Processing for 90 working days (4 months)

4 hrs./day × 90 days = 360 hrs.
₱350.00/hr. × 360 hrs. = ₱126,000.00

B) Analysis and interpretation for 40 working days (2 months)

4 hrs./day × 40 days = 160 hrs.
₱350.00/hr. × 160 hrs. = ₱56,000.00

TOTAL COMPUTER USAGE FEE = ₱182,000.00

3. Manpower

Position	Salary/Mo.	No. of Working Mos	TOTAL
1 Sr. Geophysicist	₱2,403.00	6	₱14,418.00
2 Geophysicists	4,174.00	6	26,244.00
1 Programmer	2,000.00	6	12,000.00
1 Computer II	946.00	6	6,276.00
1 Cartographer	946.00	2	2,092.00
		GRAND TOTAL.....	₱61,030.00
			₱62,000.00

4. Whiteprinting of Bathymetric Maps & Track-chart

4 copies each of maps printed in scales: 1,500,000
1,100,000
1,250,000

Approximately ₱1,000.00

5. Others:

A) Transportation expenses: From BMG to Computer Installation of Bureau of Lands and Back.

₱2.00/person for 130 working days = ₱260.00

4 persons × ₱260.00 = ₱1,040.00

B) Supplies and Materials:

a)	10 rolls tracing paper	₱3,000.00
b)	10 rolls Cross-section Paper	2,000.00
c)	5 rolls acetate film	4,000.00
d)	20 boxes punch cards (10,000 cards)	2,000.00
e)	Additional Tapes (4)	2,000.00
f)	Miscellaneous	2,000.00
		₱15,000.00
		1,000.00
		₱16,000.00

MARINE SEISMIC DATA PROCESSING AND INTERPRETATION

DETAILS OF COST ESTIMATE

1. Cost of 100 magnetic tapes, for original data

Specification: 9 - Track, 1600 BPI, 2400 ÷ 1

Canister - ₱265.00

Tape seal belt - ₱245.00

₱510.00

₱510 × 100 = ₱51,000

Cost of 100 additional tapes for storage of Corrected Data = ₱51,000

TOTAL COST OF MAGNETIC TAPES = ₱102,000.00

2. Computer Usage Fee

A) Processing for 60 working days (3 months)

4 hrs./day × 60 days = 240 hrs.

₱350.00/hr. × 240 hrs. = ₱84,000.00

B) Analysis and Interpretation for 90 working days (4 months)

4 hrs./day × 90 days = 360 hrs.

360 hrs. × ₱350.00 = ₱126,000.00

TOTAL COMPUTER USAGE FEE = ₱210,000.00

3. Manpower

Position	Salary/Mo.	No. of Working Mos.	TOTAL
1 Sr. Mining Engr./ Geophysicist	₱2,553.00	7	₱18,571.00
2 Geophysicists	4,174.00	7	30,618.00
1 Geologist	2,087.00	4	8,748.00
1 Programmer	2,000.00	7	14,000.00
1 Computer II	946.00	7	7,322.00
1 Cartographer	946.00	4	4,184.00
		GRAND TOTAL	₱85,443.00
			₱84,000.00

4. Printing of Bathymetric Maps & Track-chart

Rate : ₱0.50/sq. ft. of Map

Assume: ₱1,000.00 (4 copies each map)

5. Others:

A) Transportation Expenses: From BMG to Computer Installaiton at Bureau of Lands and Back

₱2.00/person for 150 working days = ₱300.00/personnel

4 personnels × ₱300.00 = ₱1,200.00

B) Supplies and Materials:

a)	10 rolls Tracing Paper	₱3,000.00
b)	10 rolls Cross-section Paper	2,000.00
c)	4 rolls Acetate Film	3,200.00
d)	Miscellaneous	3,000.00
	TOTAL	₱11,200.00

OVERALL TOTAL:

1.	Tapes	₱204,000.00
2.	Computer Usage:	
	A. Magnetics	₱182,000.00
	B. Seismic	₱210,000.00
3.	Manpower:	
	A. Magnetics	₱62,000.00
	B. Seismic	₱84,000.00
4.	Printing	₱2,000.00
5.	Others	
	A. Transportation	₱2,200.00
	B. Supplies	₱27,200.00
	OVERALL TOTAL	₱772,400.00

COST ESTIMATE OF SAMPLE ANALYSIS
(ROCK & SEDIMENT SAMPLES)

	SEDIMENT SAMPLES	PRICE PER 100 RAW SMAPLES
1.	Sieve Analysis	₱1,000.00
2.	Heavy Media Separation	₱15,000.00
3.	Magnetic Separation (Isodynamic Method)	₱10,000.00
4.	Mineralogical Identification (Grain Mounted)	₱75,000.00
	TOTAL	₱101,000.00

ROCK SAMPLES

1.	Petrographic, mineragraphic identification of rock samples	₱5,000.00
2.	Paleontological dating	₱5,000.00
	Assaying service (Assuming price elements to be assayed per sample at ₱70.00/ element)	₱35,000.00
	TOTAL	₱45,000.00
	OVER ALL TOTAL	₱146,000.00

この試算値は，調査団においてもほぼ妥当であると判断した。

本船の場合，マグネットテープは年間４００Magnet tapes が必要であり，サンプルは年間４００個と推定される。

従ってデータ解析費用の年間合計は約１1,１００万円（３７０万ペソ）である。